Extendible Mast

The invention relates to an extendible mast particularly for supporting a camera.

When a builder needs to assess a roof, or the upper part of a building he usually needs to erect and mount scaffolding in order to gain access to the part to be assessed. Often he will find that there is a problem with part of the roof, that the roof requires maintenance work, but that in order to have the best access to that part of the roof he needs to move the scaffolding. This is time consuming and increases the overall cost of the maintenance work. It would be helpful to have a way of assessing the roof, or upper part of a building without having to erect and mount scaffolding or directly access the roof.

Masts and other support units for supporting detection devices such as cameras, lights, infra red detectors and smoke or chemical pollution detectors are known in the art. Cameras may be mounted on large tripods, or on cranes, and are sometimes mounted on masts on vehicles. However such support units have two main disadvantages. The support units are either too unstable to be used above a certain height, the unit being susceptible to serious damage by wind, and being incapable of accurately positioning the camera; or are too cumbersome to be easily portable. In order to be strong enough to withstand windy conditions the support units are heavy. This makes them difficult to transport and erect. Hence some of the support units are mounted on vehicles. This solves the problem of transporting the support unit, but, due to the size of the vehicle, limits the locations in which the support unit can be used. For example, the support unit cannot be used in narrow passageways between buildings. Vehicle-mounted masts are expensive because, to the cost of the mast must be added the cost of buying and maintaining the vehicle. It would be useful to have a support unit, which could be used to mount a camera, which is both strong and easily portable without a vehicle.

The invention provides a freestanding, portable, extendible mast arranged to support a detection device, comprising a plurality of telescopic sections each being moveable

between a stored position and an extended position, wherein the mast is between 30 feet (8.5m) and 130 feet (37m) in length when all the sections are fully extended.

By freestanding it is meant that the mast does not need to be mounted on a separate base or vehicle.

By portable, it is meant that the mast can be moved, at least for short distances, by hand, without needing a vehicle.

By telescopic, it is meant that the sections of the mast overlap, and the amount of overlap may be altered between the stored and extended positions.

Such a mast may be used to raise a camera, or other device above a roof or alongside a building, or into the canopy of a tree to allow the area to be viewed without erecting scaffolding.

Preferably the mast is between 50 feet (14m) and 100 feet (28m) in length when all the sections are in the elongated position, more preferably between 65 feet (18.5) and 85 feet (24.5). The mast preferably weighs between 2.5 and 3.5 hundred weight, more preferably approximately 3 hundred weight which allows it to be carried by one or two people.

Preferably the mechanism for moving the mast between the stored position and the extended position is external, being located on the outside of the mast. The mechanism is therefore accessible, facilitating the maintenance and the repair of the mast.

The mast preferably has up to 10 sections, most preferably between 5 and 8 sections. The sections are preferably substantially equal in length, and fit one inside another. The diameters are chosen such that the sections can be moved in relation to one another, that is to say the sections do not fit tightly together. The diameter of the widest section is preferably between 5 and 9 inches wide, more preferably between 6 and 8 inches wide.

Most preferably it is 7 inches wide. Each section is preferably between 11 and 13 feet in length. When elongated there is preferably between 1 and 3 feet of overlap between one section and another. The mast, therefore, is preferably narrow relative to its height. This advantageously can be achieved by having the mechanism located on the outside of the mast. The narrow dimension of the mast also means the mast is small, lightweight and is particularly compact in its stored position. This therefore also reduces the cost of its manufacture.

Preferably the mast is moveable between the stored position and the extended position by hand. The mast is preferably provided with a hand driven drive mechanism, most preferably a chain and sprocket wheel arrangement to allow extension of the sections. In addition, the chain is preferably external, outside the mast. Advantageously, the chain is easy to maintain and repair.

The chain and sprocket wheel arrangement preferably comprises a chain and two sprocket wheels and may include a cranked handle which can be used to turn one of the sprocket wheels, and hence drive the chain. The handle may be linked directly to one of the sprocket wheels, or may be linked to a transfer unit by a second similar chain. The transfer unit includes first and second sprocket wheels which rotate together. The first wheel is turned by the second chain, and the second wheel drives the first chain. Turning the first sprocket wheel with the second chain turns the second sprocket wheel. The drive mechanism may be geared by using first and second sprocket wheels of different sizes to make extending the sections easier. Alternatively the drive mechanism may include hydraulic apparatus for extension of the sections.

The drive mechanism is preferably dimensioned to correspond to the length of one of the telescopic sections. Advantageously, this minimises the weight of the mast.

More preferably, the chain of the drive mechanism is substantially no more than twice the length of a section of the mast. Therefore, the weight of the mast is minimised and housing is not required in which to store the chain when the mast is in the stored position.

The drive mechanism also preferably includes a braking mechanism, to allow the mast to be extended or returned to the stored position safely. The brake mechanism may be applied when a section is partially extended, to prevent the section falling back towards the stored position. The mechanism may be a simple brake which can be applied to the drive mechanism. For example, when the drive mechanism is a chain and sprocket, the braking mechanism may be in the form of a ratchet pawl which engages the chain to prevent the section from dropping.

Each section, with the possible exception of the innermost section, is preferably provided with a longitudinal slot, in the section wall, to provide access to the inner sections. The apertures are aligned with one other. Further each of the sections, except the outermost, is preferably provided with an aperture for receiving a pin to link the sections to the drive mechanism in order to extend them. In the most preferred embodiment, each section except the innermost section has a longitudinal slot on diametrically opposing sides so that the pin can pass right through the mast. Also in the most preferred embodiment each section except the innermost section has an aperture on diametrically opposing sides so that the pin can pass right through the mast.

In the preferred embodiment, not only do the longitudinal slots align, but the apertures also align with those slots. In addition, the apertures are arranged such that, when the mast is in the stored position, the apertures of each of the sections are arranged so that each of them can be seen separately through the slot in the outermost section. The aperture of the innermost section is arranged at the top so that it will be the first section to be lifted by the pin. Each aperture beneath that of the innermost section corresponds to the next outermost section.

The drive mechanism preferably includes a linker in the chain for linking the mechanism to section to be extended. The linker has a body provided with an aperture for receiving a pin, which can be inserted through the linker and into the aperture in the section to be raised.

The lower end of each section is preferably provided with a sill, which protrudes from the outer circumference of the section. The sill is preferably approximately 1 inch wide. The sill aids in stabilising the mast as it provides contact between a section and the corresponding lower section to reduce lateral movement between the sections, particularly when extended.

The sections of the mast are preferably moveable between the stored position to the elongated position one at a time. This means that the drive mechanism for raising the mast need only be the length of one section of the mast, minimising the weight of the mechanism. Once each section is fully extended it can preferably be locked in place. Any standard locking mechanism may be used. For example a bolt may be passed through an aperture in the top of a lower section and an aperture in the bottom of the upper section. Preferably the locking mechanism comprises a pin which is passed through an aperture in the top of a lower section and a corresponding aperture in an upper section. The sections are preferably provided with further apertures, which are diametrically opposite the first apertures allowing the pin to pass right through the mast.

The mast preferably further comprises a base, upon which the mast may be stood. The base may include handles to allow the mast to be easily moved. For the same purpose the base may also be mounted on wheels, particularly castors, or on a trolley. The base is preferably at least 20 inches in length and width, more preferably 24 inches, to provide stability. For further stability the mast may be provided with guide wires for attachment to the ground or to a building.

The sections of the mast are preferably made of aluminium to make the mast reasonably light. The base is preferably made of steel for strength.

The inner section is preferably provided with a mounting for a camera or other device. The mounting is preferably rotatable and preferably can be controlled remotely to pan and tilt.

Preferably the mast also comprises a camera, particularly a video camera. The camera is preferably mounted on the inner section of the mast, more preferably via a rotatable mounting. Alternatively the mast may comprise a light, an infra red detector or a smoke or chemical pollutants detector, or other detection equipment.

The invention further provides an extendible mast comprising a plurality of telescopic sections, moveable between a stored position and an extended position, each section being provided with a longitudinal slot, and an aperture; the mast further comprising a chain and sprocket drive mechanism for extending the sections, the chain including a linker for connecting the chain to the section to be extended. The linker may comprise a body having an aperture. Preferably, a pin is inserted through linker aperture into the aperture in the section to be extended.

A specific embodiment of the invention will now be described by way of example only, with reference to the drawings in which:

Figure 1 shows a mast according to the invention in the stored position;
Figure 2 shows a mast according to the invention in a partially extended position; and
Figure 3 shows the mast of figure 2 with an alternative drive mechanism.

Referring first to Figure 1, the mast 5 comprises a plurality of telescopic sections 10a, 10b, 10c, and 10d. The sections 10a, 10b, 10c and 10d are cylindrical and are of decreasing diameter such that they fit inside one another as shown. The mast further comprises a base 12, which has handles, 14, so the mast may be easily carried. Each section 10a, 10b, 10c and 10d, except the innermost section 10d is provided with a longitudinal slot 16, which allows access to the inner sections 10b, 10c, and 10b for extending the mast. The longitudinal slots 16 of each section are aligned. The inner sections 10b, 10c and 10d are also provided with an aperture 17, which allows attachment of the section to a drive mechanism (not shown in Figure 1) which is used to extend the mast.

The aperture 17 of each section also aligns with the slot 16 in the outermost section 10a. This allows access to the apertures 17 to enable the sections to be lifted. Both the slots of each section and the apertures of each section may include corresponding slots or apertures on the diametrically opposite side of each section so that, as will be explained below, when a pin is inserted through an aperture 17, it passes through the opposite side of the mast. The mast can operate with or without the slots and apertures at the far side of the mast as appropriate. It will be appreciated that the slots in the sections allow the inner sections to be lifted since they allow access to the apertures 17 of the innermost sections.

Figure 2 shows the mast 5, in a partially extended position. The mast in Figure 2 has three sections, the innermost section, 10c has been fully extended. The sections are raised one at a time using a sprocket wheel 18 and chain 20 drive mechanism. The mechanism additionally includes an idler sprocket wheel 19 around which the chain passes. Thus, the chain 20 passes over the sprocket wheel 18 and the idler sprocket wheel 19. A handle 22 is provided to turn the sprocket wheel 18 and drive the chain. In the first embodiment the handle 22 is attached to the sprocket wheel 18. An alternative embodiment is shown in Figure 3.

The chain 20 includes a linker 34 to connect the chain to the section to be raised. The linker 34 includes an aperture through which a pin 36 can be passed. The pin 36 is then inserted into the aperture 17 in the section to be raised connecting the linker and section.

Once a section is extended it is locked in place using a bolt 24 and aperture 26. The bolt 24 is passed through an aperture 26 in the top of the lower section 10b and aperture 26 in the bottom of the upper section 10c.

The sections are provided with a pin 24 and aperture 26 to lock each section into place when fully extended.

Figure 3 shows an alternative embodiment, in which a second drive chain 28 and a handle are provided. The sprocket wheel 18 which has been described in Figure 2 forms part of a transfer unit. In addition, the transfer unit includes a second sprocket wheel 30 which is connected to the main sprocket wheel 18. The two sprocket wheels are fixed together and rotate together. This means that, if the second sprocket wheel 30 is rotated, the main sprocket wheel 18 will also turn at the same speed. This turns the drive chain 20. The second drive chain 28 passes over the second sprocket wheel 30 and over a handle sprocket wheel 33 which is turned by a cranked handle. Thus, as the cranked handle is turned, the handle sprocket wheel 33 is turned which drives the second drive chain 28 around the second sprocket wheel 30 within the transfer unit. This in turn drives the main sprocket wheel 18 to move the chain 20. In this embodiment it is possible to include one or more gears by altering the size of the second sprocket 30 in comparison with the main sprocket. This can make extending the sections easier, particularly if the mast has a large number of sections.

A camera (not shown) is mounted to the inner section of the mast. The camera is mounted on a rotatable mounting and arranged to tilt and pan in order to survey an area. The mast is extended to the required height and the camera used to record the area under investigation.

In use, a camera is mounted onto the inner section 10c. The pin 36 is inserted through the linker 34 into the aperture 17 in the inner section 10c connecting the linker 34 to the section 10c. The handle 22 is turned, driving the chain 20 and lifting the linker 34, and hence the section 10c. Once the section 10c is fully extended, the bolt 24 is inserted through apertures 26 in the bottom and top of the inner and middle sections (10c and 10b), respectively. The pin 36 is removed from the linker 34 and the handle 22 turned to lower the linker 34. It is then joined to the middle section 10b and that section raised in the same way.

Once the mast is fully extended guide wires, not shown, are used to tether the mast.